U.S. Department of the Interior National Park Service
and
National Recreation and Park Association

Design

Winter 1984

Design

A publication of the Park Practice Program

The Park Practice Program is a cooperative effort of the National Park Service and the National Recreation and Park Association.

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Membership in the Park Practice Program includes a subscription to all three publications and a library of back issues arranged in binders with indices, and all publications for the remainder of the calendar year.

The initial membership fee is $105; annual renewal is $45. A separate subscription to *Design* is $70 initially, and $18 upon renewal. Subscription applications and fees, and membership inquiries should be sent *only* to: National Recreation and Park Association, 3101 Park Center Drive, Alexandria, VA 22302.

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Articles, suggestions, ideas and comments are invited and should be sent to the Park Practice Program, National Park Service, Washington, D.C. 20240.

Dear Readers:

This Winter 1984 issue of DESIGN is devoted to new energy-efficient buildings of the Northern Virginia Regional Park Authority, Fairfax, Virginia. Featured are designs for a 1,500 square foot office addition to an existing 5,000 square foot administration building and an Arboretum which is now under construction. The Headquarters office addition earned a Certificate of Achievement from the 1983 Owens-Corning Fiberglass Energy Conservation Awards, the highest recognition in the country for energy conscious design.

Our thanks to Darrell Winslow, Executive Director of the Northern Virginia Regional Park Authority and Lawrence Cook AIA and Associates for sharing these designs and architectural renderings with our DESIGN subscribers and readers.

Editor

This chart indicates the proper place to insert new design sheets in your DESIGN binder.

Behind Index No.	Insert New Sheet Index No.	Backed by Index No.
A-1908	A-1909	A-1910
A-1910	A-1911	A-1912
A-1912	A-1913	A-1914
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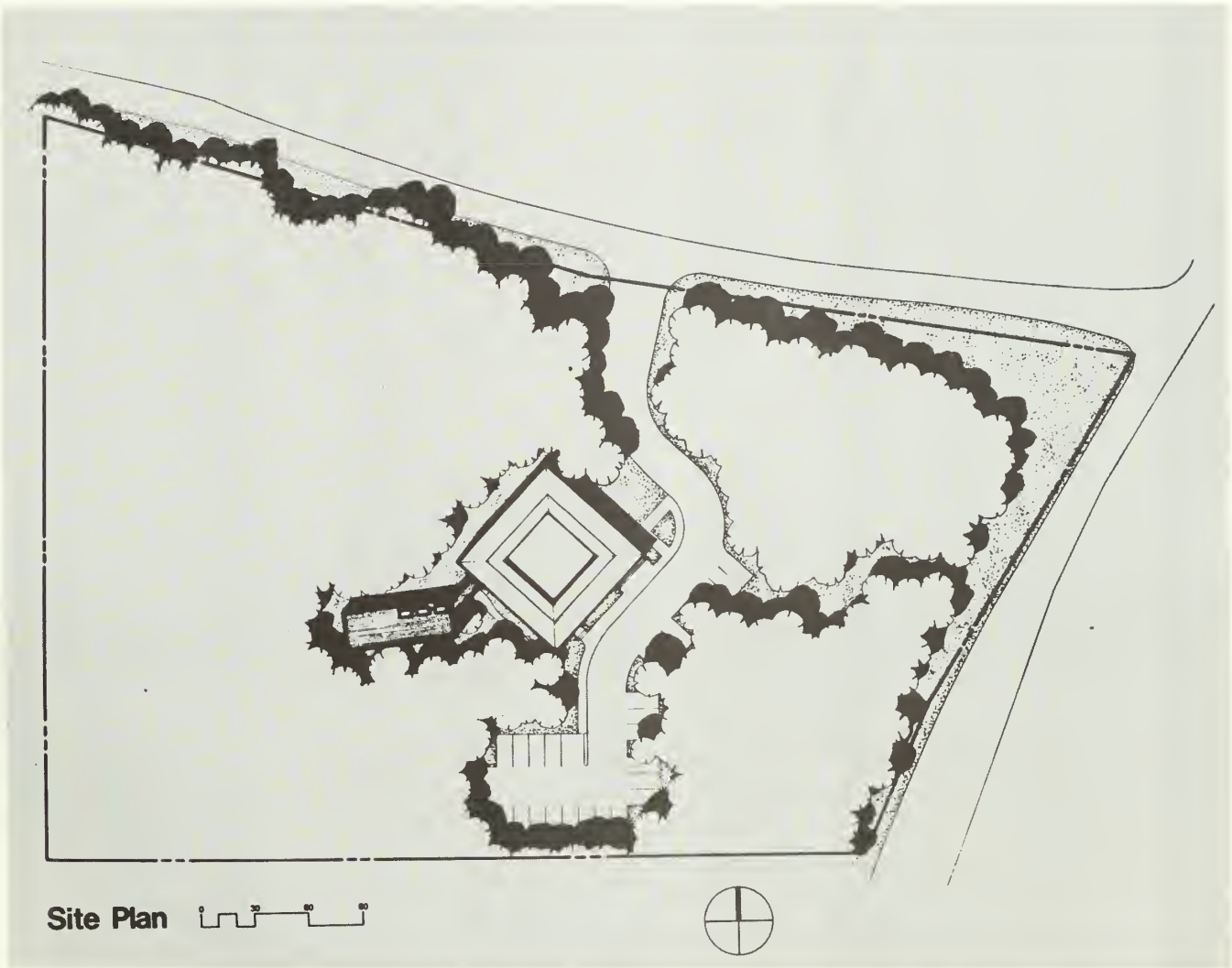
B-3827	B-3828	B-3829
B-3829	B-3830	B-3831
B-3831	B-3832	B-3833

Headquarter's Addition

Northern Virginia Regional Park Authority



The Northern Virginia Regional Park Authority commissioned Lawrence Cook AIA and Associates of Falls Church, Virginia to design an energy efficient 1,500 square foot office addition to an existing 5,000 square foot administration building. The building is located outside of Washington, D.C. on a three-acre, heavily wooded site.

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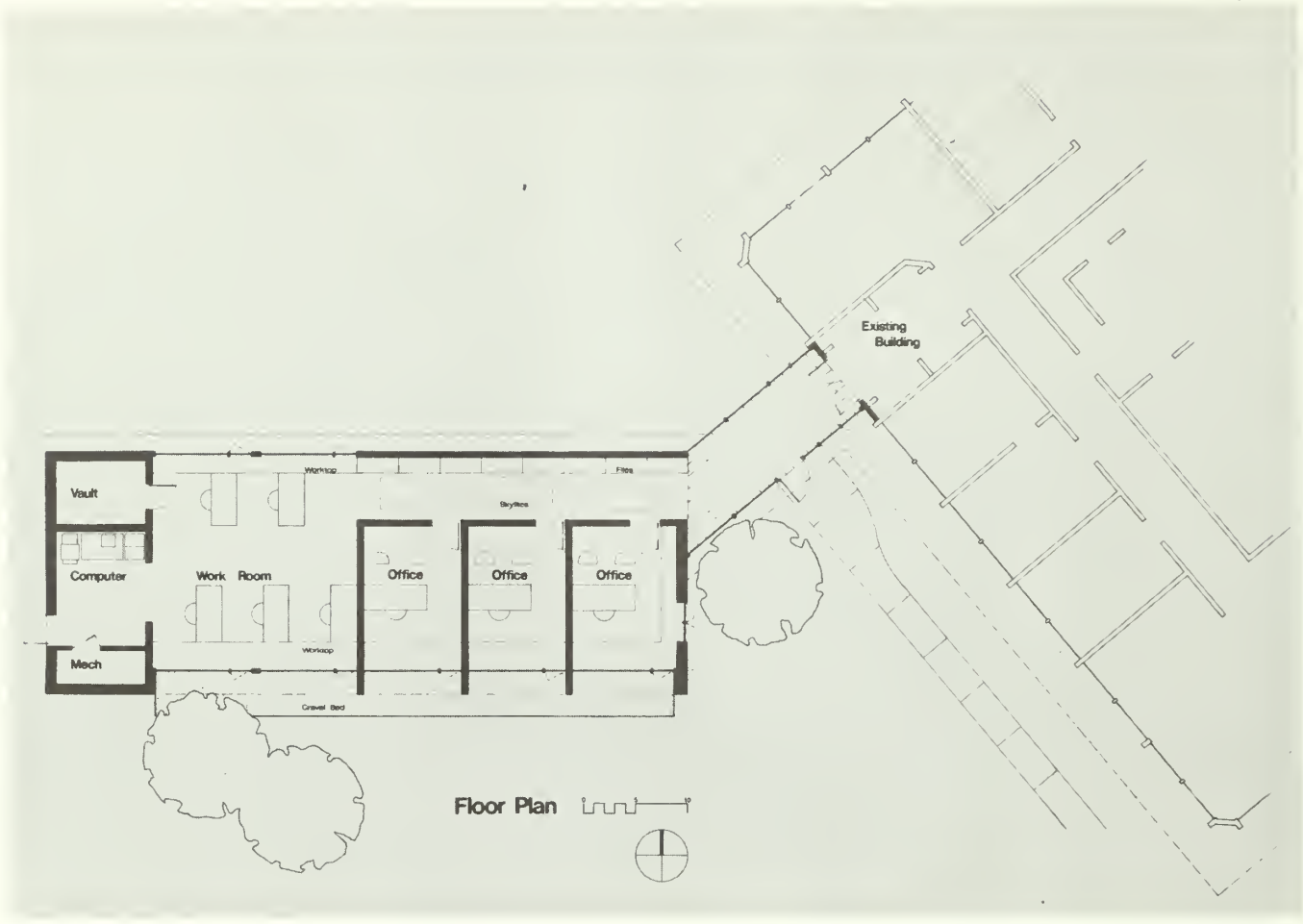
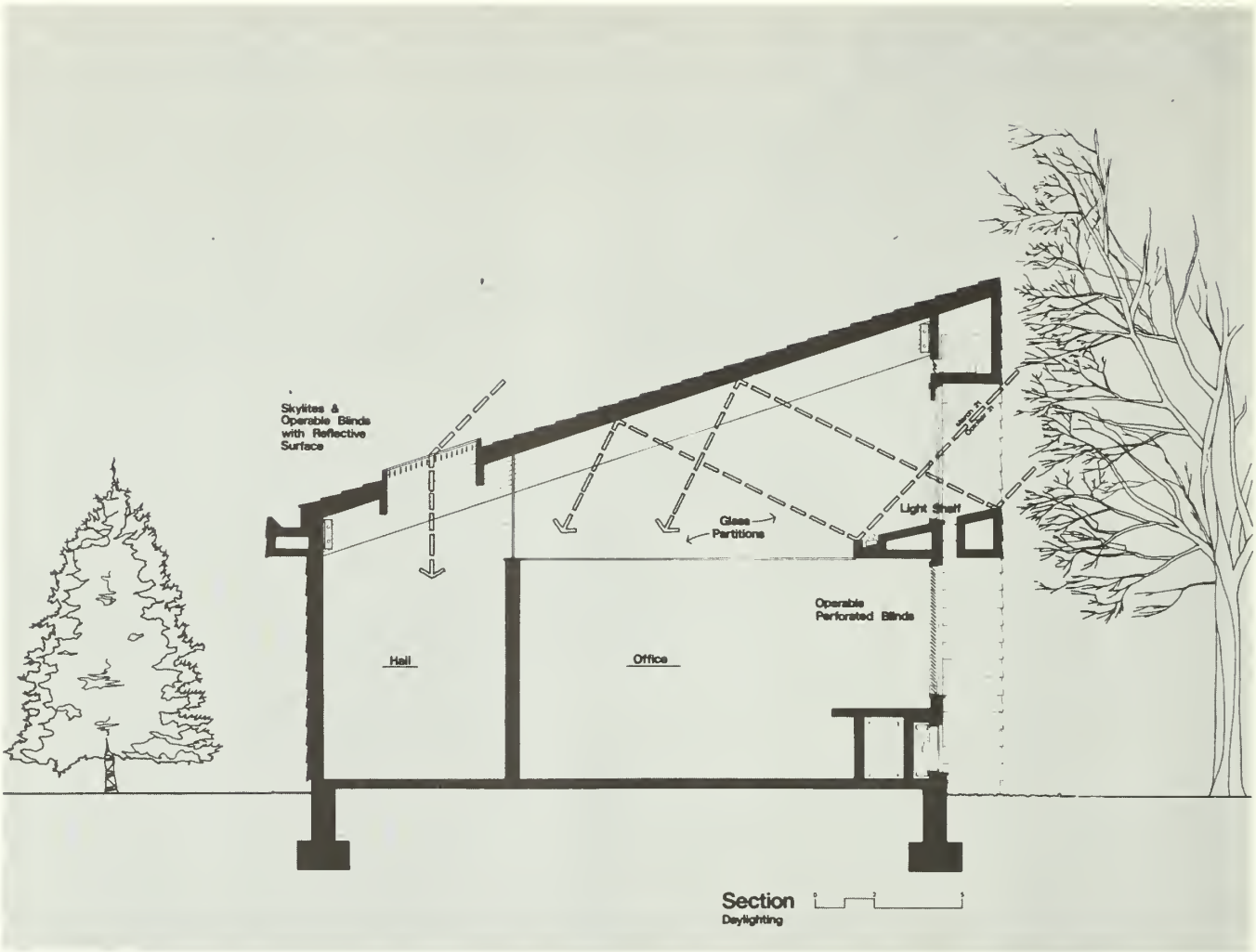
Headquarter's Addition		Contributed by
Index A-1909	Winter 1984	Darrell Winslow NVRPA
	Control N-1657-A	



The architect's approach was to examine the staff's working patterns, the various functions of the staff and the size of the addition. This analysis showed that natural daylighting would provide the greatest energy savings while heating and cooling could offer still more savings. By the use of siting, glazing, a light shelf, reflective surfaces, glass partitions and skylites, the architect provided 87% of the required lighting and approximately 38% of the heating from the sun.

The architect's energy concepts cover five basic areas including daylighting, direct solar heat gain, a solar preheater for fresh air, destratification of hot air, and natural ventilation.

Headquarter's addition (cont'd) A-1911

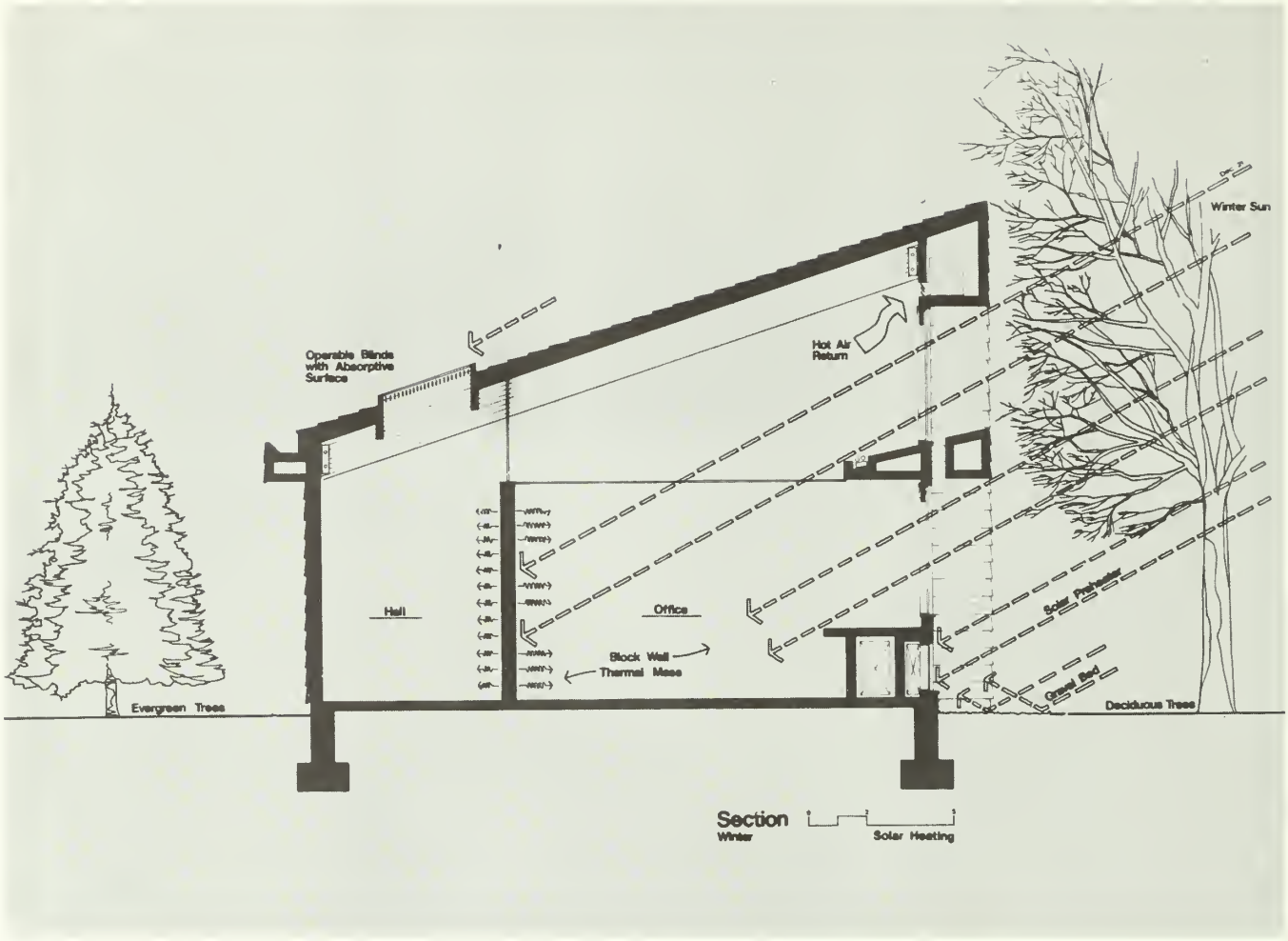


Daylighting

Daylighting is achieved by the use of southern glazing and a light shelf with a reflective top surface that bounces light up to the wood ceiling and back down into the work space. The light shelf also contains a strip of indirect fluorescent light for very overcast days. Individual control of task lighting at desk top, and perforated blinds at each work station increases the user's control of the lighting level. The worktop counters have a neutral surface to eliminate glare.

Direct Solar Heat Gain

Direct solar heat gain is provided in winter by the sun shining all day on the interior masonry partitions. This stored heat is then released slowly to maintain overnight temperature. The night insulation over windows also helps lessen night heat loss. A quick heatup in the morning is again provided by direct solar gain, as well as computer and employee body heat.



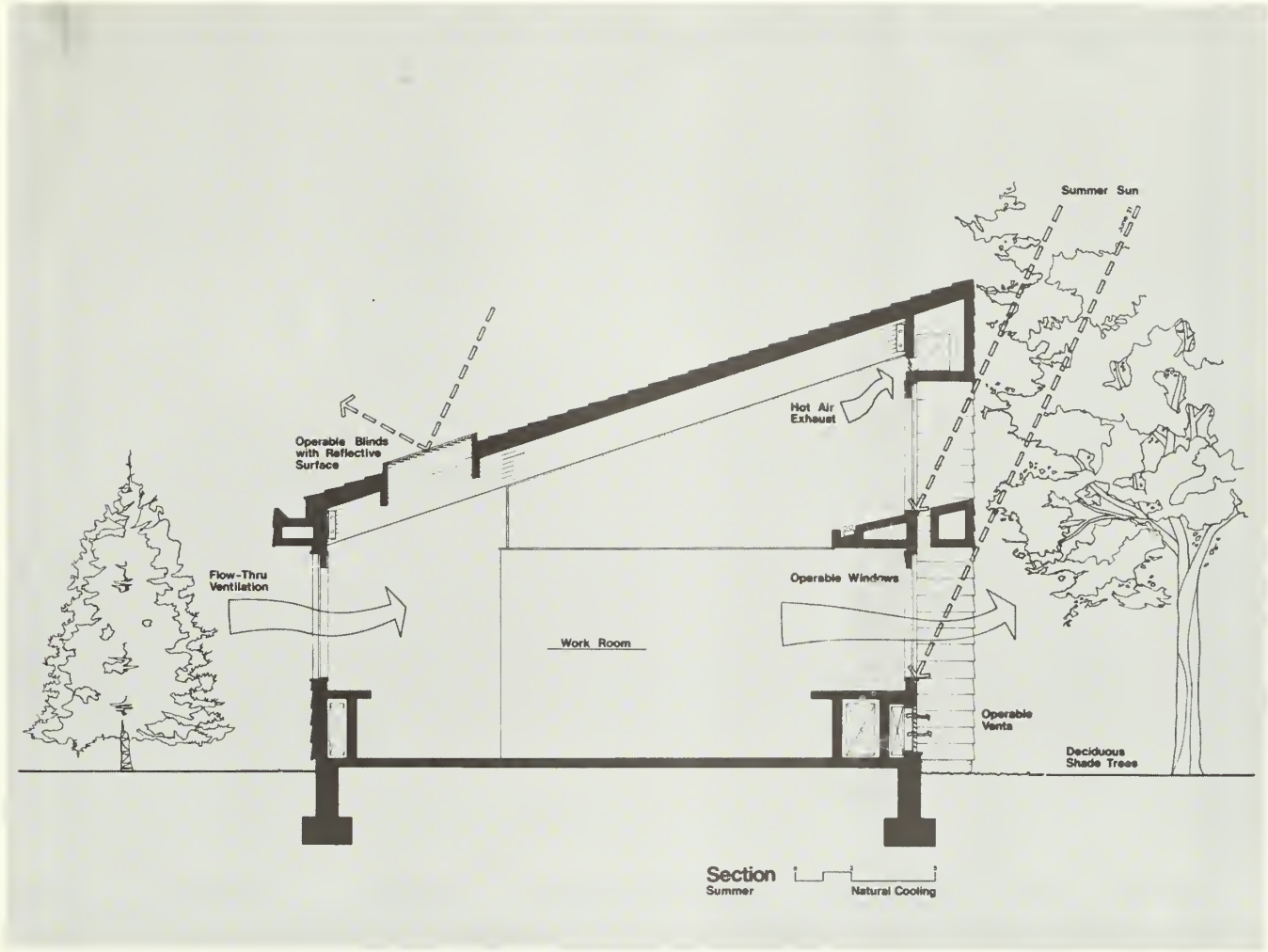
Solar Preheater

A solar preheater runs along the entire southern exposure at the lower windows to preheat the intake of cold fresh air in winter. The preheater also creates positive air pressure within the space to limit air infiltration. In summer this heat is released through small vents at each window.

Destratification

Destratification of hot air is achieved by returns located at the highest possible location above the top windows. They correct hot air stratification by returning the hottest air back through the mechanical system.

During winter this hot air is recirculated through the duct system to provide space heating, and switches to an outside exhaust system to provide space cooling during summer.



Natural Ventilation

Natural ventilation for summer cooling is provided by operable windows located on both sides of the building in the direction of the prevailing breezes. Mechanical air conditioning is provided for the high humidity of late summer. The combined effect of these energy design features will save the owner an estimated 68% of the energy cost that would have been consumed by a conventional office of the same size.

Materials

The structural shell is concrete block wrapped with 2'' exterior insulation board with a nailable outer surface. The exterior is clad with cedar shingles on the walls and cedar shakes on the roof. Inside, laminated wood beams and wood deck form the roof structural system. All partitions are concrete masonry units with wet plaster finish for solar heat storage. The upper part of the partitions is glass to increase daylight distribution. The mechanical back-up heating and cooling system is an electric heat pump.

Award

In recognition of their exceptional design the owner and architect received a Certificate of Achievement from the 1983 Owens-Corning Fiberglass Energy Conservation Awards, the highest recognition in the country for energy conscious design. The Award reads: "Your commitment to energy conservation serves as an example that creative design techniques can significantly lessen the country's dependence on scarce and valuable energy resources."

For further information regarding this facility contact:

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Arboretum

Northern Virginia Regional Park Authority

A beautiful 70-acre tract of farmland in Vienna, Virginia was donated in 1980 by Gardiner Means and his wife Caroline Ware to the Northern Virginia Regional Park Authority to be developed into an Arboretum. The Authority selected three firms to execute the design: architect Lawrence Cook AIA and Associates, landscape architect EDAW Inc., and site engineer William Gordon Associates, Inc.

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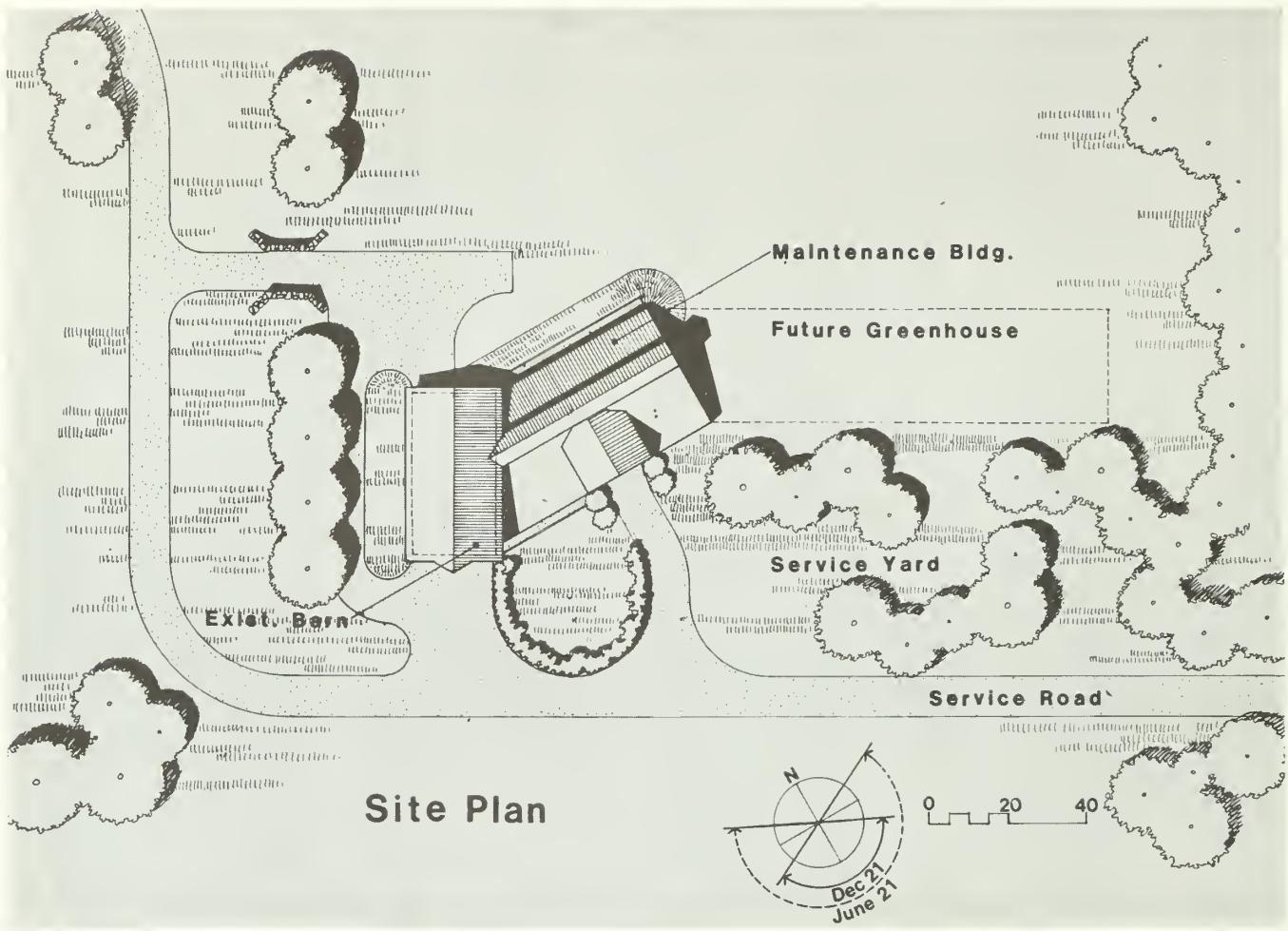
Arboretum		Contributed by
Index B-3828	Winter 1984	Darrell Winslow NVRPA
	Control N-1658-B	



Site Plan

Maintenance Facility

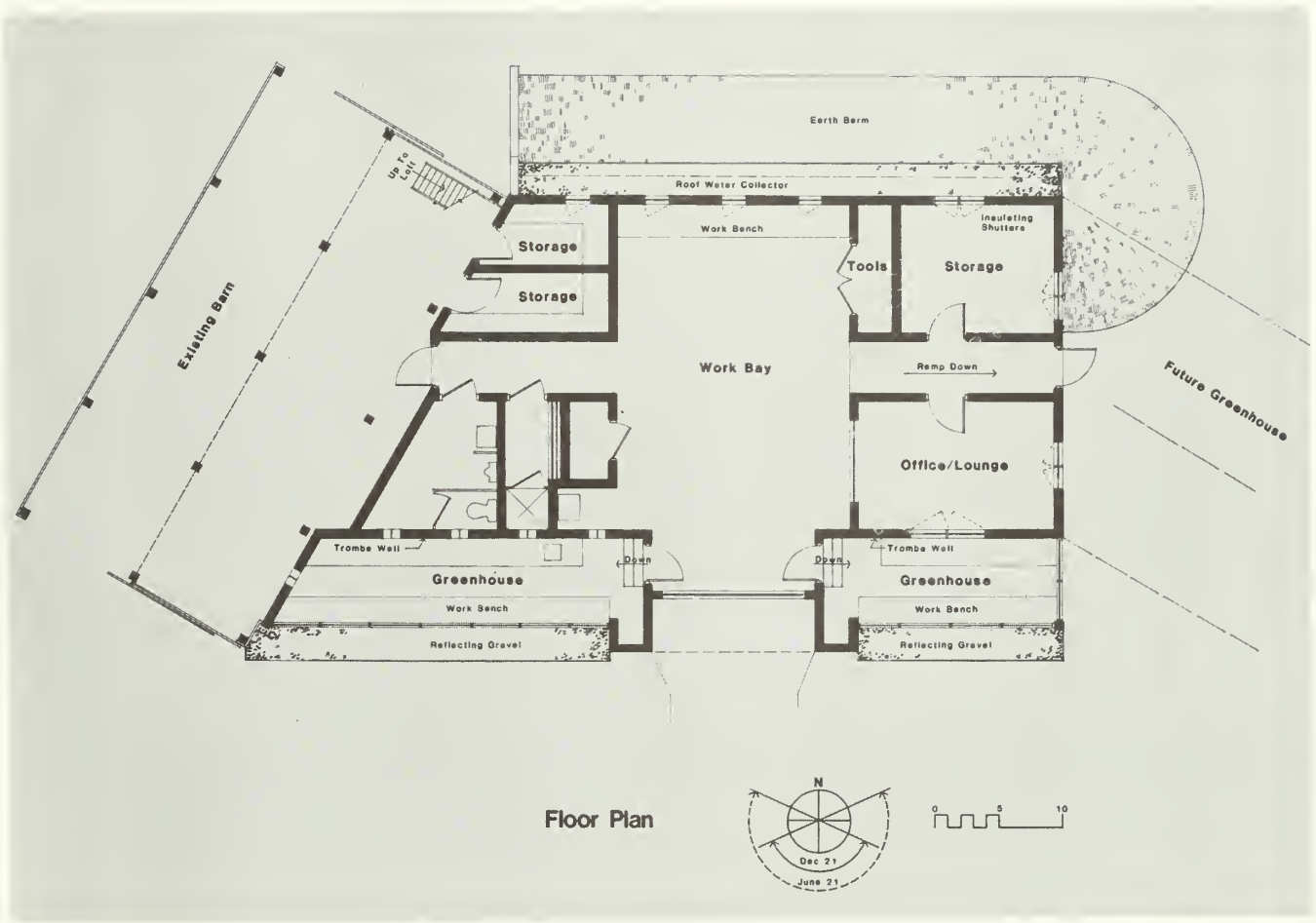
The maintenance facility is the first of several buildings to be constructed at the Arboretum. It forms the central facility from which the maintenance staff will operate. It will consist of four parts as shown on the site plan:

1. The existing 1,200 square foot barn which will be renovated to shelter tractors, trucks and heavy equipment on the ground level, and bulk storage on the loft level;

2. The new 2,000 square foot building which will provide for the needs of the employees, a greenhouse to germinate seedlings, and secure storage rooms;

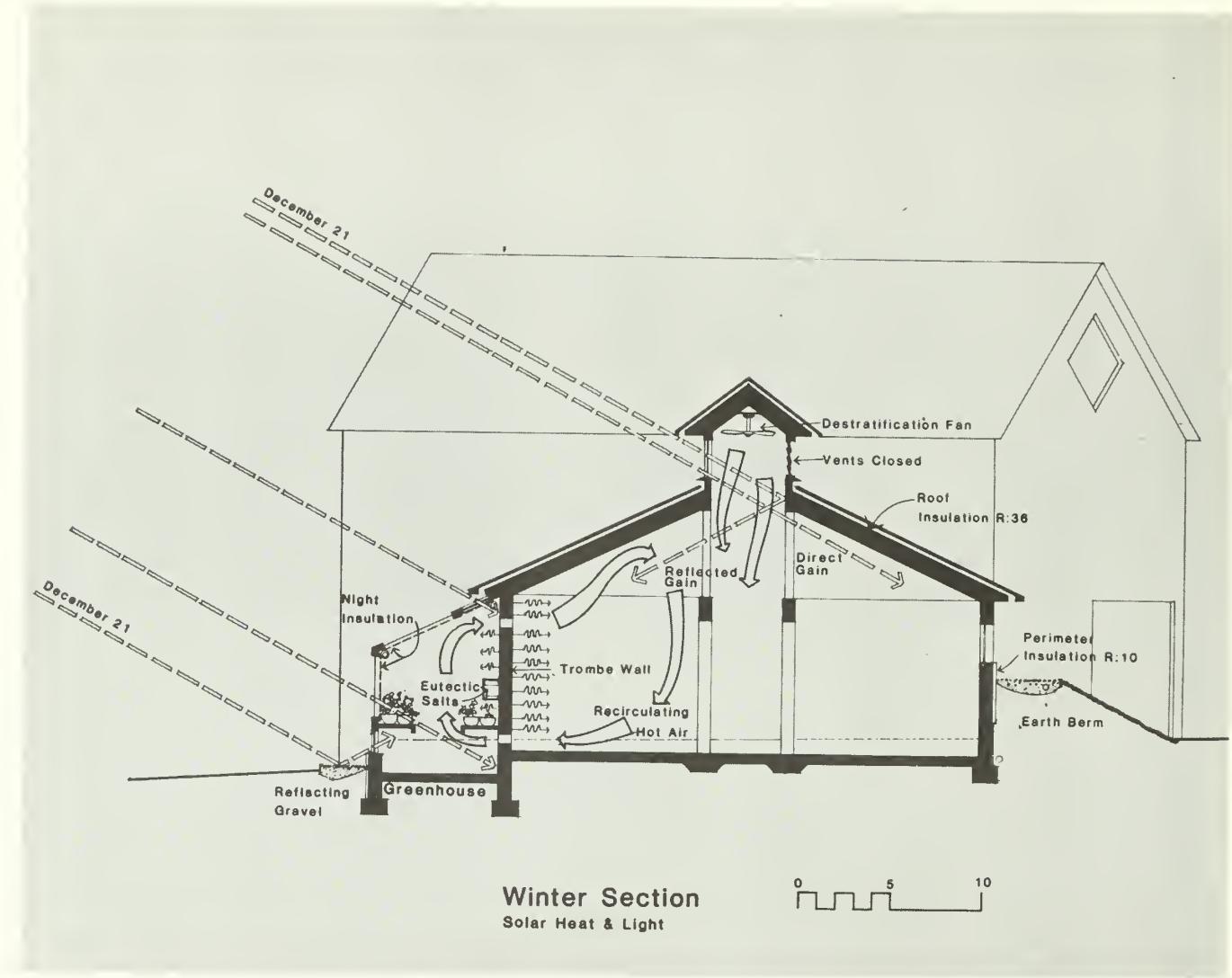
3. The future 3,000 square foot greenhouse for year-round growing;

4. Outdoor storage yards and planting areas.



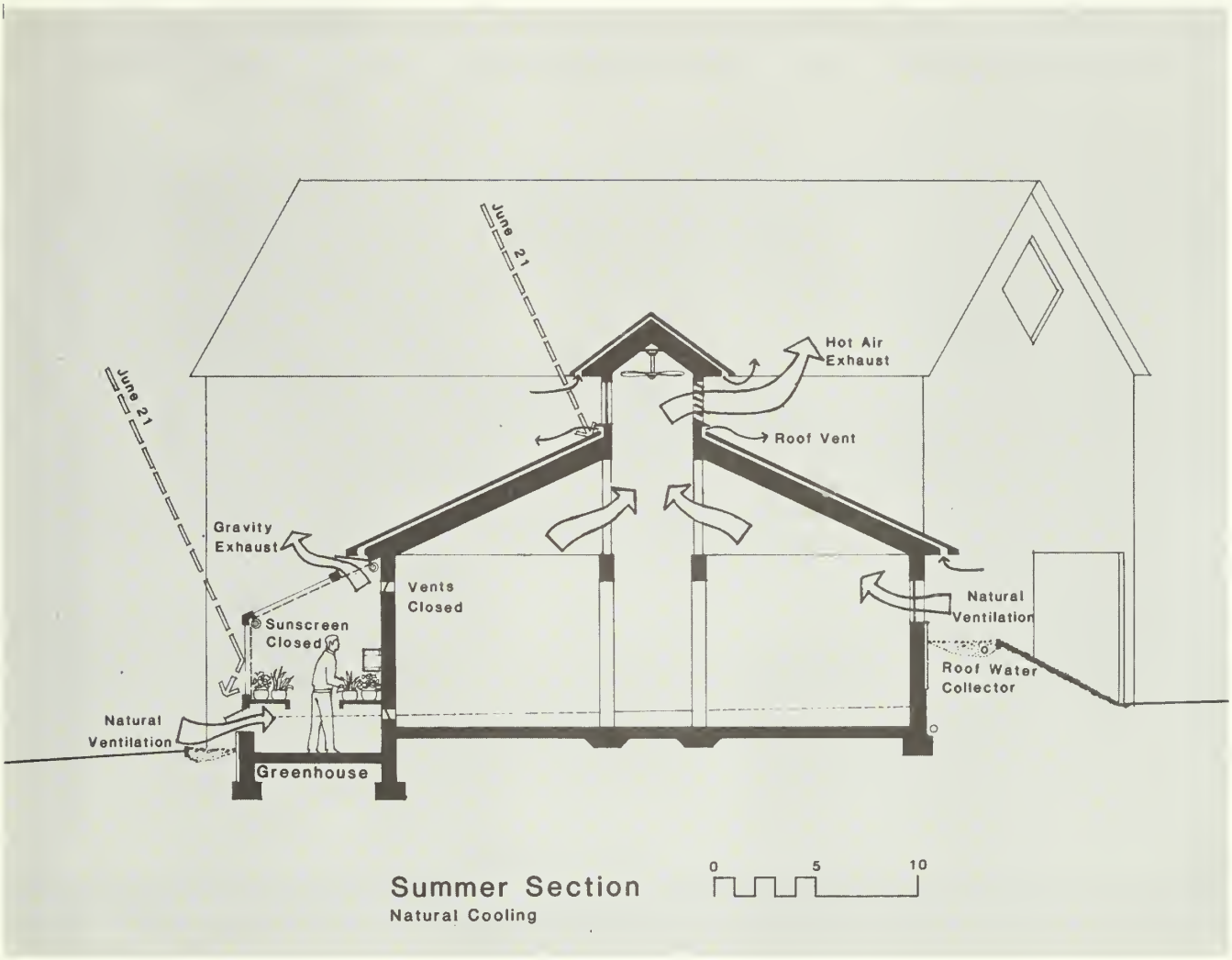
Floor Plan

The floor plan shows four "layers" of spaces related to solar gain: The greenhouse faces due south for maximum solar gain; the employee facilities; the corridor with clerestory light; and the storage rooms on the north side. Mechanical heating by means of a heat pump will be provided only in the employee facilities and work bay. Mechanical cooling will be used only in the office/lounge. Major energy features include the greenhouse with roll down insulating screens, the Trombe wall with selective surface, and the clerestory with windows and vents. Minor energy features are the self venting roof, eutectic salt tubes, destratification fans, insulated shutters, earth berm, and reflective gravel beds.



Winter Mode

During the day the sun heats the greenhouse, the Trombe wall and the eutectic salt tubes. The Trombe wall absorbs and stores solar radiation. A small recirculating fan moves the excess heat from the greenhouse into the occupied spaces. At night the screens are pulled down to lessen the rapid loss of heat from the greenhouse. The south facing side of the Trombe wall is coated with a selective surface of black film which increases absorption of solar energy and also causes the wall to transmit heat inward by reflecting outward radiation. The Trombe wall releases about two thirds of its stored heat to the employee spaces and one third to the greenhouse, thus preventing night freezing. The eutectic salts absorb solar heat during the day and release it at night through a phase change process from liquid to solid. Tubes of eutectic salts are approximately three times as effective as the Trombe wall per equal surface area. The interior spaces also receive some direct gain of solar heat through the clerestory windows. The destratification fans return the hot air which rises into the clerestory space. The earth berm insulates the north wall.



Summer Mode

The greenhouse vents are opened for the season allowing a continuous flow of air which greatly improves plant growth while preventing the space from overheating. The sunscreens are kept down on sunny days to reduce excessive sunlight which causes unwanted heat gain and burns the plants from overexposure. The Trombe wall assists in summer cooling by shedding heat at night as cooler air moves across the wall. The following day the Trombe wall absorbs heat out of the space. The clerestory vents release excess heat day and night. Heavy cooler air enters through windows, forcing the lighter warm air to rise and exhaust through the clerestory vents. The roof vent system reduces the highest roof temperatures by 10 degrees to 30 degrees Fa renheit above the roof insulation.

Daylighting

Daylighting is provided through the clerestory windows which allow winter sunlight to shine both directly and reflectively into interior spaces. The partitions are open above the 8'-0'' wall height. The occupied spaces are also daylighted through windows and glass block facing into the greenhouse. The beds of light colored gravel along the south and north walls greatly increase daylighting through diffused exterior reflection.

Materials

For the structural shell, exposed concrete block was selected for solar storage mass, durability, minimal maintenance, and economy. The exterior of the shell is wrapped with 2'' rigid insulation board and sheathed with wood board and batten to match the existing barn. The floors are exposed concrete. The attic and roof are standard wood framing, sheathed with plywood, and clad with inexpensive farm roofing sheet metal. The greenhouse and oversized garage door are custom built from standard dual glazing components including continuous operable windows below the growing shelves and top vents.

All windows are operable for natural ventilation, glazed to lessen heat transmission, and covered with interior insulated shutters.

The owner's requirements of low life cycle costs are met by minimal energy consumption year round, low maintenance costs over long and short terms, and a reasonably low initial cost.